Read 13.1 - 13.2

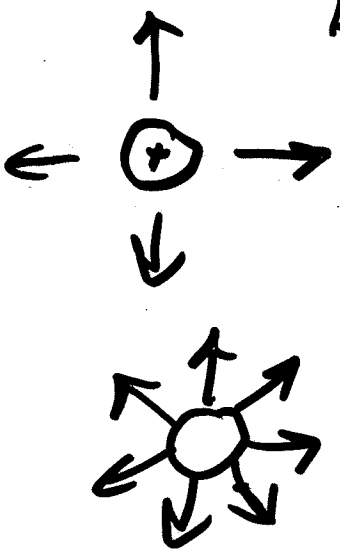
"Pi" day 3-14

H.w Due Monday after break

Review

$\vec{F} = \vec{E} q$

$\vec{E}$ field



point in direction a positive charge would feel a force

density related to size of charge creating field and to size of E field

can never cross

no!

Problem: Two plates 27 mm apart and are oppositely charged so that they have a uniform electric field of 750 N/C between them. An object with a charge of $-8.3\ \mu C$ is moved from the negative plate to the positive plate.

A) What is the change in electric potential of the object?

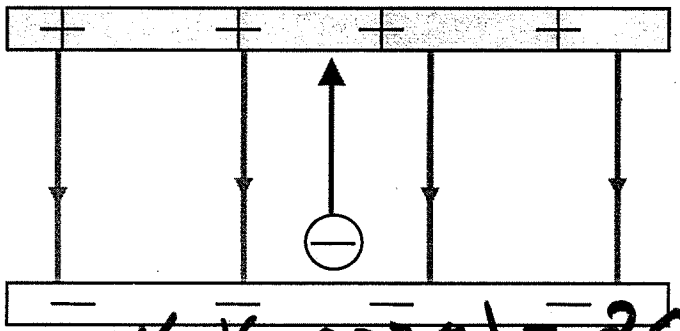
B) What is the change in electric potential energy?

C) Answer the same two questions for a positive charge.

$E = 750\ N/C$

$q = -8.3 \times 10^{-6}\ C$

$d = .027\ m$



what

ΔV

ΔPE

A) $V = Ed = (750\ N/C)(.027\ m) = 20\ V$

B) $\Delta PE = qV = (-8.3 \times 10^{-6}\ C)(20\ V) = -1.7 \times 10^{-4}\ J$

C) charge does not matter 20V

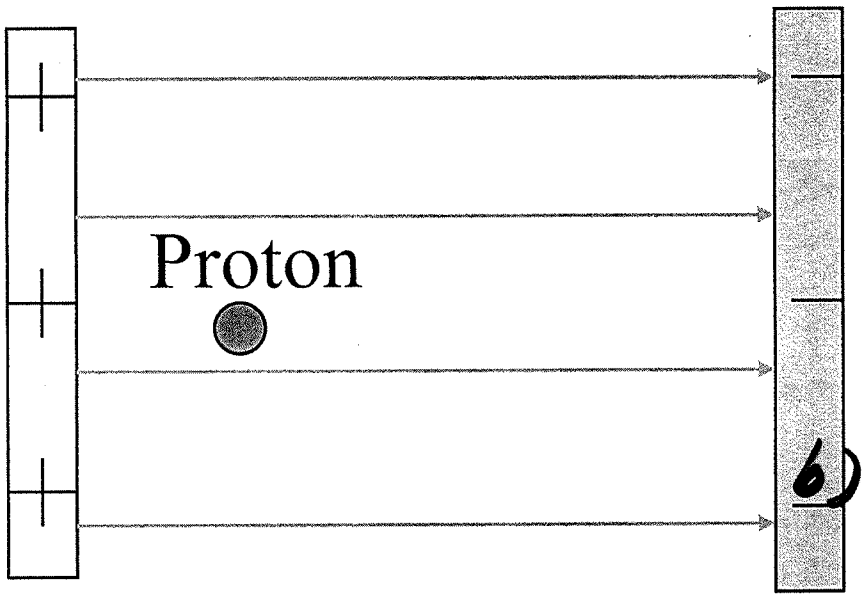
$\Delta PE = +1.7 \times 10^{-4}\ J$

Problem: A proton is released from rest in a uniform electric field of magnitude 8×10^4 V/m. After the proton has moved 0.5 meters,

(a) What is the change in electric potential?

(b) What is the change in potential energy?

(c) What is the speed of the proton?



$E = 8\times10^4$ V/m proton +

$d = .5$ m

$q = 1.6\times10^{-19}$ C, $m = 1.67\times10^{-27}$ kg } table

a) $V = -Ed = (-8\times10^4 \text{ V/m})(.5\text{ m})$

$= -4\times10^4$ V

b) $\Delta PE = q\Delta V = (1.6\times10^{-19}\text{ C})(-4\times10^4\text{ V})$

$= -6.4\times10^{-15}$ J

$K_i E_i + P_i E_i = K_f E_f + P_f E_f$

$0 + 0 = \frac{1}{2}mv_f^2 + q\Delta V$

$\frac{1}{2}mv_f^2 = -q\Delta V$

$v_f = \sqrt{\frac{-2q\Delta V}{m}} = \sqrt{\frac{-2(-6.4\times10^{-15}\text{ J})}{1.67\times10^{-27}\text{ kg}}} = 2.8\times10^6$ m/s

Interactive Question

The normal tendency of positive charges is to

A) move to regions of higher electric potential
B) move to regions of lower electric potential
C) remain stationary in an electric field
D) move perpendicularly to electric field lines
E) None of the above

Interactive Question

E

Which of the following is *not* true?

A) The natural tendency of a negative charge is to move to regions of higher electric potential.

B) A positive charge can be moved to regions of higher electric potential by an external force.

C) When a positive charge moves to a lower electric potential its potential energy decreases.

D) When a negative charge moves to a lower electric potential its potential energy increases.

E) None of the above. They are all true.

Interactive Question

(A)

The picture shows equipotential lines. Where is the electric field the greatest?